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Calculate the Ratios of Some Heavy Metals and the Physical Properties of the Soil Used in the Local Brick Industry

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Abstract

The purpose of this study was to determine the validity of the soils used in the manufacture of bricks in terms of the ratios of some heavy elements and their impact on the characteristics of the bricks first and their impact on environmental pollution. This study was based on a field survey of ten sites, with five samples from areas used as quarries for the brick factory, and five samples of brick bricks for the same quarry, ie brick bricks for the same quarry, to find the ratios of the heavy elements of five different elements in the sample of the quarry and compare them with the same elements in brick bricks for the same quarry The soil properties (particle size gradient, organic matter, hydrogen function and electrical conductivity) were studied and their effect on the bricks used in the brick industry was studied. The concentration of the elements was(110.2) Pb, (8.2) Cd (39) Zn (53.4) Cu (37.8) Ni in the unit per million of the quarry, but the concentration of the coffee blocks was (113.6) Pb, (9.4) Cd 40.2 (Zn) 53.8 (Cu) 39 (Ni) ppm. The concentration of lead, cadmium and copper is high for both quarry and brick blocks. As for zinc and nickel, the concentrations were less than the permissible limit, which leads to the conclusion that pollution is the result of human environmental activities.

Keywords: bricks; soil; soil characteristics; environmental pollution.

1. Introduction

Most of the countries of the world experience many environmental problems as a result of industrial development. The most important of these is the pollution of soils with heavy elements, which is considered the most dangerous of these species, although some elements are necessary for life in small quantities. However, they become poisonous when there are high concentrations in soils [1].

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There are many factors that help to raise the proportions of these elements in the soils, including the process of brick industry, which is an important construction industries and because of its strategic role in the process of economic development, from the positive side, but from the downside is the industry of bricks from industries that put toxins and cause pollution The environment through the use of contaminated water and black oil in addition to the use of the untreated heavy metals [2]. The use of more than one method for the manufacture of bricks, including old and modern bricks can be defined as a fixed-dimensional clay structure and achieve degrees High heat is used in the field of construction and has the ability to withstand weight, impact resistance and air changes [3]. The bricks are pieces of clay, light, calcium, sand, concrete or any other suitable material that works in a systematic manner. The dimensions can be easily manufactured, transported and used in construction and have the ability to carry weight, resist impacts and changes in air. The bricks are classified according to a number of factors, including the materials used in its manufacture such as mud, clay, sand, and concrete blocks, or the method of making it such as mechanical, semi-mechanical and manual bricks or for the quality of the bricks in relation to the heat given to the bricks such as the yellow, yellow and white bricks. Spaces in structural structures [4]. The bricks used in Iraq are smaller than the bricks used in the Abbasid period. The dimensions of the bricks are based on the basis of the design requirements, ease of construction, transportation and production [5]. And the standard dimensions are (240 * 115 * 75) mm. Pollutants from the manufacture of bricks are dangerous pollutants that lead to pollution of air, water and soil. The gases and evaporation from the stacks of the brick factories cause serious pollution that negatively affects the environment, especially air that is directly contaminated and with increased concentrations of toxic and harmful contaminants. Human Health [6]. Soil factors are relatively important factors in addition to climatic factors. These factors include soil and pH, organic matter and high salinity in some soils used in the brick industry due to lack of rain and increased evaporation due to recent high temperature in the southern and central regions Because of the phenomenon of global warming and this leads to the bloom of bricks (the high proportion of salt on the surface of the blocks, which weakens the resistance to climatic conditions.

2. Research problem

The Turbine is classified as containing high levels of heavy metals as polluted soil and becomes poisonous to plants, animals and humans. It also changes the physical and chemical properties of the soil, thus disrupting the biological balance of the soil. In order to measure the environmental pollution of the heavy elements because of the great danger to the environment in general and especially when there is a population density near the source of environmental pollution had to be studied to ensure balance between the exploitation of wealth and conservation of the environment and the first to maintain the health of the population of diseases caused by The accumulation of heavy elements in their bodies without feeling the so-called silent epidemic

Search area:

The samples were collected from five regions between the different southern and central regions of Thi Qar, Wasit and Maysan governorates. These areas are characterized by muddy green soil, according to the results of tables No. (4-3) showing the percentages of sand, mud and sands found in the quarry soils Preferred areas, because the soil is muddy green and Figure (1) illustrates areas of study. The neighborhood district is located in

the city of Kut, which is located on the Tigris River and is divided by rivers: Dujaili, Gharraf, Shat Shatrah, Shat Al Bida, and others. It is a coastal region with a climate between the Mediterranean climate and the hot and dry desert climate, low rainfall and high temperature. Where the rise from March, culminating in July and August. The city of Amara is located in the province of Maysan is one of the provinces of Iraq, in the east of the country on the Iranian border, its capital Amara on the Tigris River. Al-Islah, Al-Rifa'i and Al-Qal'a are located in the Dhi Qar Governorate.

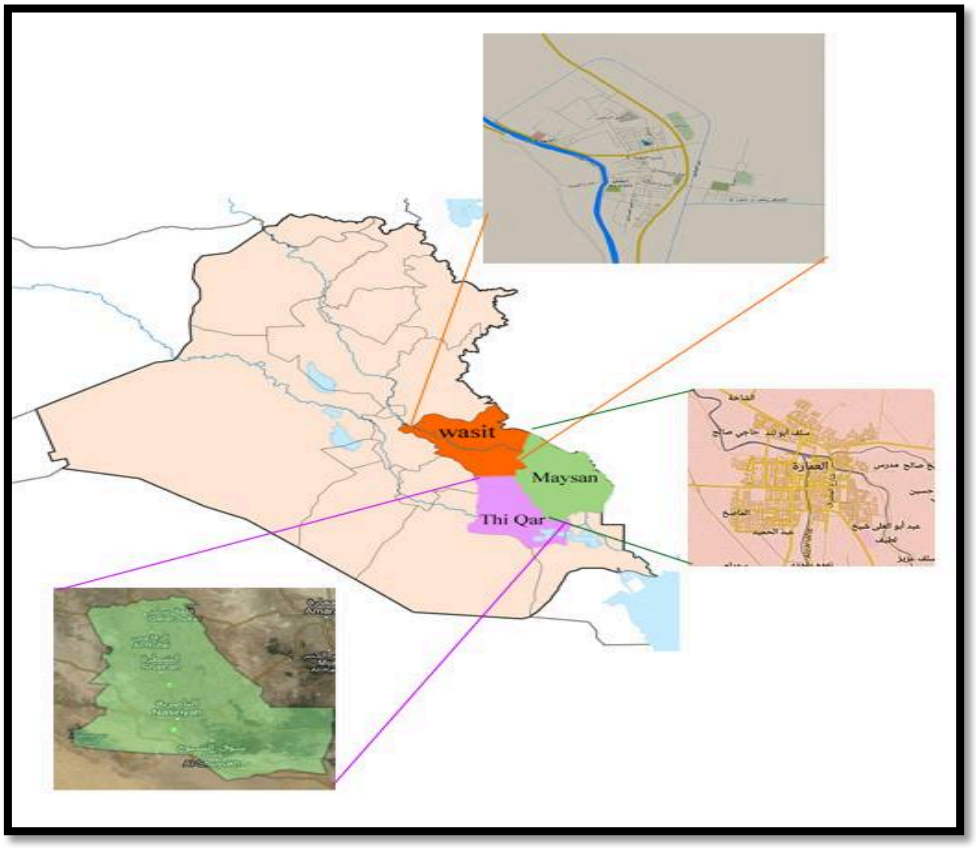


Figure 1: represents the current study areas

Search Goal:

The first objective is to calculate the percentages of heavy metals in the soils used in the manufacture of bricks prior to their introduction into the plant (the areas of collecting the soil) and comparing them with the proportions of the elements after their introduction into the labs and their negative impact on the quality of the bricks and human health.

The second objective is to find the relationship between the concentration of heavy elements in the soil, the hydrogen function and the volumetric gradation, on the one hand, and the electrical conductivity and organic materials on the other. The third objective: study the effect of after or near the coefficient of bricks on the role of housing and its role in soil pollution by heavy elements.

3. Field and laboratory work

Collection of samples

The samples were collected for ten different models of quarry quarries by two models for each city (five cities) from the southern cities of DhiQar, Wasit and Maysan governorates for the quarries of the most productive factories and consumption of the bricks and comparing the results with the results of grinding the produced blocks for each of the five labs. To know the ratios of heavy elements before the introduction of the laboratory and after production and determine the quality of the bricks and the extent of its usefulness for use.

Laboratory Procedures

1-Analysis of elements (lead, cadmium, zinc and copper) Analysis of elements (Pb, Cd, Zn, Cu, Ni)

The method of Jackson was used to calculate the concentrations of heavy elements in the selected soil samples. After completing the modeling process, the samples were fragmented and approximately(1 g) of each sample was taken in a manner that ensures the sample is well represented. The sample then passes through a series of stages for geochemical analysis, Atomic Absorption The final analysis was conducted at the laboratory of the Department of Life Sciences at the College of Science / University of Baghdad. The basic stages of processing the samples and preparing them for the final analysis according to Jackson method [7].

1-Grinding the soil sample using a ceramic mortar after drying in a 100 ° C oven for two hours

2-Conduct the sieving of the ground model through a sieve (0.07 mm)

3-Weight 1 g of the dried sample and put in a clean beaker (250ml) using a sensitive balance

4-Assemble the sample by adding (15 ml) of HCl with 5 mL of concentrated nitric acid (HNO_3)

5- The sample shall be placed in a sand bath for 60-45 minutes

6-Cool the baker to the laboratory heat and add (5ml) of HCl acid and heat in a sand bath to dry and take about 10-5 min

7-Cool the baker and add (5 ml) of HCl and (50 ml) of hot distilled water to wash the baker sides of the dissolved sample traces.

8-Heat the mixture to boiling point for 2-3 minutes

9-Filtration with filter paper (No. 42) Place, leachate in a volume bottle of capacity (100 ml)

10-Wash the insoluble precipitation with distilled water and add the wash water to the leachate and complete the volume to 100ml) and then send it for analysis by Atomic Absorption.

2- Measure PH Function of Soil Samples

Ten samples were taken from the soil samples of the southern regions and the hydrogen function was measured by taking 1 g of the dried sample at 100 ° C (100 ° C) and adding it to 100 ml of distilled water and mixing it for half an hour. (1) The hydrogen function of the filter is measured.

3- Granular Gradient Analysis of soil Samples

The previously mentioned samples were used to measure the ratio of sand, silt and mud for these samples using the Hydrometer method, depending on the work contexts of the GEM. The stages of analysis of the gradient in the selected soils were carried out according to the following:

1-Weight 50 g of the sample and wash the sample with a 0.063 mm sieve to separate the clay from sand

2-Place the sand in the baker and place in an oven at a temperature of (150 °C).

3-Place the mud in a vibrator for 15 minutes to disassemble the particles

4-After 24 hours, a small sample of stagnant samples is taken and barium chloride is added to ensure that it is free of salts. If there is interaction with barium chloride, this means that salts are present in the sample.

5-The clay is dried in a container inside the oven at a temperature of (50-45 °C) to prevent the disintegration of the particles.

6-After drying, the clay and sand are weighed in a sensitive balance and the difference in weight represents the amount of salts.

7-The clay is taken and a solution (125 ml) is added from the calcon (sodium hexamethaphosphate) which is brought from 40 g of sodium hexametaphosphate and melted with 100 ml of distilled water

8-Place the mixture in a listed drum, add the distilled water, take another listed drum, and add only distilled water

9-Water temperature measured by a thermometer.

10-The capacitor is placed in the inserted cylinder and the readings are taken according to certain times (1/4 minutes, 1 minute, 1 minute, 2 minutes, 3 minutes, 15 minutes, 30 minutes, 60 minutes, 240 minutes, and the next day) On the particle diameter of both Silt and Clay.

4-Measuring the Amount of organic Matter

The selected samples were previously taken to measure the proportion of organic matter found in them

according to Al-Janabi and his colleagues [8].

The stages of measuring the amount of organic matter in the selected soils were carried out according to the following:

1. The weight of 3 g of the dried sample in a temperature oven (100OC) in Baker capacity (250 ml)
2. Add 10 (ml) of $K_2 Cr_2 O_7$ (1N) and (200 ml) of H_2SO_4
3. Leave the sample for 20 minutes
4. Dilute the sample with distilled water to (200 ml)
5. Addition (10 ml) of H_3PO_4
6. Sampling of hydrolytic sulfate with O2H7 (0.5) N FeSO4 by using amino sulfate biphenyl barium as an indicator of the endpoint as the color changes from yellow to green

5-Electrical conductivity

Electrical conductivity or electrical resistance was tested using an electrical metering device and the device was given a direct reading (mm/cm ovaldismymns / m -1) and following the following steps:[9]

1. Pull by pipette 5 ml of leachate and place in a flask conical flask
2. Add to the leachate 20 ml distilled water for the purpose of mitigation
3. Add five drops of (NaOH) solution to increase the pH of the filtrate to about 12, making the center of the base where it leads to the deposition of element ions (copper, nitric, iron, manganese, tin) and prevent their interaction
4. Add 50 mg of Almair and Casside
5. Shake the mixture and moisten the EDTA solution (0.01N) until the color changes from pink to purple.
6. Then, record the user's EDTA size Calculation of the value of calcium in mg / l.

Practical part:

This section presents the practical part that was conducted in order to determine the concentration of some heavy elements (lead, cadmium, zinc,copper and Nical) in the soil of the areas under study and discuss the natural factors that control the concentrations of these elements such as hydrogenation, organic matter and particle size gradient in the soil samples mentioned above.

We studied the content of heavy metals (Pb, Cd, Zn, Cu& Ni) in the soil samples in the study areas using the atomic absorption spectrometer after conducting the geo chemical analysis of all samples. Some calculations and statistical equations were carried out within the values and concentration we obtained from the elements.

The correlations are calculated between the concentrations of lead, cadmium, zinc, copper and nickel on the one hand, and the natural factors that control the concentrations of these elements on the other hand, three high concentration samples, and three samples with low concentration of elements (R) is equal to (1). This indicates the state of absolute correlation, while the value (1) indicates the state of full reverse correlation and the equations The following [10].

$$r = \frac{\frac{1}{N}\sum (Xi - \overline{X})(Yi - \overline{Y})}{(S.D_X) \times (S.D_Y)} \quad \ldots\ldots\ldots\ldots (1)$$

r = Pearson's linear correlation coefficient

Xi = The first variable

Yi = the second variable

S.DY, S.DX The standard deviation of the first and second variables, respectively

$\overline{X}$: The average value of the first variable

$\overline{Y}$: The average value N of the second variable

The Excel program was used to perform calculations and extract values.

Table 1: shows the relationship between the concentration of heavy elements and the physical properties of quarry soil samples (study areas)

E.C	PH	O.M%	The concentration of heavy elements. Ppm					Study Area	NO.
			Ni	Cu	Zn	Cd	Pb		
2.3	**7.3**	**0.35**	**30**	**23**	**42**	**5**	**50**	**AL-Hayes**	**1**
4.9	**7.4**	**3.2**	**50**	**100**	**40**	**13**	**137**	**AL-Rifai**	**2**
3.1	**7.2**	**1.9**	**36**	**75**	**39**	**9**	**124**	**AL-eamara**	**3**
2.7	**7.1**	**0.4**	**35**	**45**	**38**	**7**	**120**	**Al-islah**	**4**
2.1	**7.3**	**3**	**33**	**24**	**36**	**7**	**120**	**Al-qalea**	**5**
3.02	**7.26**	**1.77**	**36.8**	**53.4**	**39**	**8.2**	**110.2**		**Rate**

1.0008	**0.1019**	**1.222**	**6.910**	**29.990**	**2**	**2.7129**	**30.742**	**Standard Deviation**
0.2543	**-0.554**	**0.937**	**0.470**	**-0.759**	**-0.707**	**-0.3127**	**0.5658**	**Correlation coefficient**

Table 2: shows the relationship between concentrations of heavy elements and the physical properties of brick, soil samples (study areas).

E.C	**PH**	**%O.M**	**Concentration in ppm**					**Location**	**Sample number**
			Ni	Cu	Zn	Cd	Pb		
2.5	**7.3**	**0. 5**	**32**	**25**	**35**	**7**	**54**	**AL-Hayes**	**1**
5.2	**7.4**	**3.1**	**54**	**105**	**47**	**15**	**137**	**AL-Rifai**	**2**
3	**7.3**	**2.1**	**38**	**70**	**43**	**9**	**129**	**AL-eamara**	**3**
2.6	**7.2**	**0.6**	**35**	**43**	**38**	**8**	**124**	**Al-islah**	**4**
2.2	**7.2**	**2.9**	**36**	**26**	**38**	**8**	**124**	**Al-qalea**	**5**
3.1	**7.28**	**1.84**	**39**	**53.8**	**40.2**	**9.4**	**113.6**		**Rate**
1.080	**0. 074**	**1.10**	**7.74**	**30.34**	**4.261**	**2.870**	**29.083**		**Standard Deviation**
0.261	**0.377**	**0.93**	**0.783**	**0.783**	**0.06**	**-0.640**	**0. 6**		**Correlation coefficient**

Table 3: shows the relationship between the scale of the quarry and the study areas

%The gluten	**% Clay**	**% The sand**	**Area**	**NO.**
57.1	**42**	**0.9**	**AL-Hayes**	**1**
53.2	**46**	**0.8**	**AL-Rifai**	**2**
52.2	**48**	**0.65**	**AL-eamara**	**3**
51.35	**44**	**3.1**	**Al-islah**	**4**
60.6	**38**	**2.4**	**Al-qalea**	**5**
54.38	**43.6**	**1.57**		**Rate**
3.498	**3.440**	**0.991**		**Standard Deviation**
0.060	**-0.411**	**0.755**	**r**	**Correlation coefficient**

Table 4: shows the relationship between the scale of the quarry and the study areas

%The gluten	**%Clay**	**%The sand**	**Area**	**Sample number**
59.4	**40**	**0.6**	**AL-Hayes**	**1**
54.4	**45**	**0.6**	**AL-Rifai**	**2**
52.2	**47**	**0.8**	**AL-eamara**	**3**
53.8	**43**	**3.2**	**Al-islah**	**4**
60.4	**37**	**2.6**	**Al-qalea**	**5**

56.04	**42.4**	**1.56**		**Rate**
3.248	**3.555**	**1.112**		**Standard Deviation**
0.060	**-0.318**	**0.838**	**r**	**Correlation coefficient**

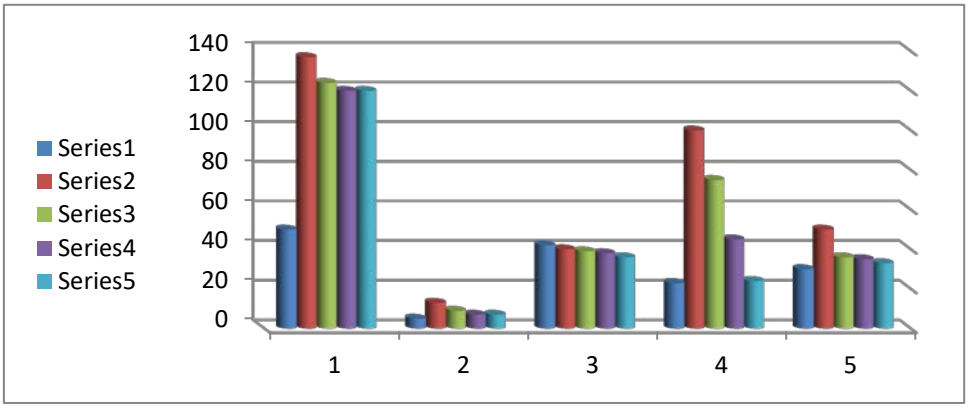


Figure 2: Concentration of heavy elements in quarantine samples

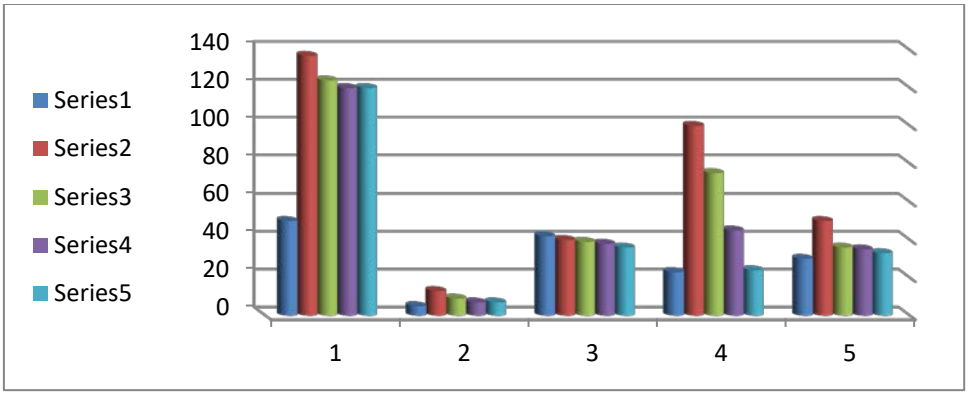
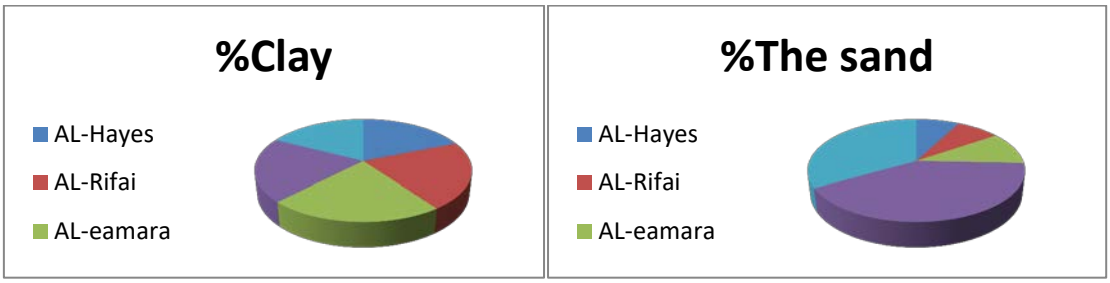


Figure 3: Concentration of heavy elements of brick samples



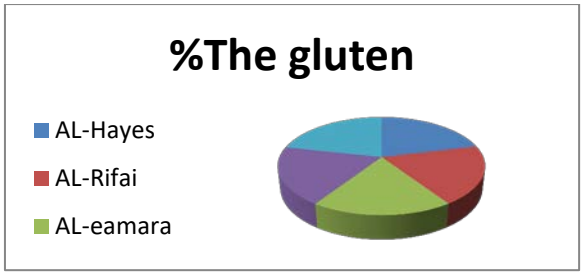


Figure 4: represents the proportions of sand, mud and silt in the sample of the bricks of the bricks.

4. Results and discussion

We can see from the table (1) highest percentage of lead> cadmium> zinc> copper> nickel in the clay models of the product before the introduction of the kiln by a small percentage of the models of the soil of the quarry, which confirms that the external activities (water quality used, climate factors [11]. In Table 2, the ratio of lead ratios is higher than the normal limit (11) Once. We also note the difference between the concentration of the elements between the samples of the bricks and the soil samples of some elements, for example the increase in the concentration of the study elements in area (1) due to the quality of water used in industry, fuel quality, In addition to the characteristics of the soil used in industry in addition to the different characteristics of soils in the study areas from one area to another according to Table No. (3,4) Lower rates of sand in the samples of the soil bricks than the samples of the soil of the quarry and the reason for this is the washing of soil samples before introduction For the production of chloride Sodium, and the effect of soil, sand, and gluten content on weathering and biodegradation processes in soils, and this is consistent with the results of [12,13]. The mud fraction was attributed to the adsorption of these elements onto the clay minerals.

When comparing the concentrations of heavy metals in the study sites with the global average concentration in the global soils [11]. We note from Table (1.2) the height of all studied elements except the concentration of the copper element and respectively Rifa'i> Architecture> Reform> Castle. This is due to the increase in the ratio of heavy elements to the natural proportions of the elements in soils, the use of excess irrigation water and the penetration of groundwater wells in the area, as well as the use of chemical fertilizers and the role of organic matter and hydrogen function, which had the role of adsorption of heavy elements and pollution from wind and water used in drying samples In addition, Al-Awwaf al-Gharbari is considered one of the most important factors that directly or indirectly contribute to the increasing phenomenon of desertification and land degradation in the central and southern regions [14]. The dryness of the dry and semi-arid regions of the dry and semi-arid regions makes it highly susceptible to any change in the known climate elements, which in turn increase the frequency and occurrence of dust storms, which have an influential role in the expansion and extent of sand dunes, which is one of the most dangerous manifestations leading to soil degradation [15].

The soil content of the heavy elements depends mainly on the mother-derived rock, so the composition varies depending on the mother rock. The base rock content of the heavy elements is richer than the sedimentary rocks as well as the weathering composition of the crust and the quantity, quality and proportion of clay minerals that are adsorbed in adsorption elements Rare or ionic exchange based on PH where the heavy kinetic mobility

increases with the increase of pH [16] as a difference in soil content of heavy elements according to their regional and climatic conditions dry areas are different from the soil area Cold tropical change depending on climatic conditions and characteristics and geochemical [17,18,19].

We can see from the tables (1.2) that there is a weak correlation between the variables except the element of nickel and the element of lead is related to strong relations with each other. This relationship may be attributed to their omission from the chimneys and they fall on the soil of the region and their adsorption of clay minerals, The movement of heavy equipment used in the extraction and the beautification and transfer of soil and bricks to and from the laboratories, where often used these vehicles fuel oil gas as well as to eat engine parts. In addition to combustion, the combustion is irregular and causes a clear variation in the intensity of fumes from chimneys over time. This situation is frequently repeated due to routine and emergency changes in the load capacity of the electric power transmission and distribution network [20].

5. Conclusions

1-Air pollution is one of the most dangerous types of pollution, which affects the human, animal and plant through their infection with some diseases and that failure to follow up and control lead to many problems.

2-We conclude that climate elements, especially wind, dust storms, temperature and acid rain affect the air pollutants and concentration in the study area

3-Wind affects and speed in the lack of concentration of pollutants in the atmosphere of the city, either temperature affects the concentration of pollutants in the atmosphere of the city where the hot months less pollution than the cold months, the rain, the increase lead to a lack of pollutants and works to clean the atmosphere of impurities as the months of winter less polluted From other months, especially rainy days.

6. Recommendations

1. Examination of the water used for washing soil samples

2. Examine the soil samples in terms of the ratios of heavy elements in the quarry area and the concern to find areas with a few concentrations of heavy elements.

3. The use of soil with a small proportion of sand, which is to ensure that the soil used in the manufacture of clay brick clay to obtain a quality of good quality.

4. Follow-up machines used in the transfer of samples from the quarry to the laboratory.

5. Setting up a mechanism for the maintenance of machines within the laboratory and the use of electrical plants and away from machines that use fuel.

6. Setting up a green belt around the laboratory, which will reduce the spread of dust and gases into the atmosphere.

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